

**REMARKS**

Claims 1 and 3-5 are all the claims pending in the application.

Claims 1 and 3-5 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Codignola (US 3,127,452).

Applicants submit that this rejection should be withdrawn because Codignola does not disclose or render obvious the present claimed invention.

The Examiner acknowledges that Codignola does not disclose (1) the superficial velocity of hydrogen gas, (2) the size of the catalyst and (3) the mole ratio of hydrogen and olefin.

However, the Examiner considers that it would have been obvious to have modified Codignola's process by selecting appropriate superficial velocities and the size of the catalyst to arrive at Applicants' claimed process.

Applicants respectfully disagree.

First, the important features of the present invention are the superficial velocity of the gas containing hydrogen, and the flow direction of the gas containing hydrogen and the liquid containing an olefin through a solid hydrogenation catalyst bed.

When the superficial velocity of the gas is lower than 3.0 cm/sec, the apparent reaction rate lowers. In addition, the lowering of the hydrogenation rate of the olefin leads to lowering of the yield through a tar formation reaction caused by formation of an olefin dimer and olefin polymer (page 3, lines 16-27 of the specification).

When the superficial velocity of the gas is higher than 10 cm/sec, a pressure loss of the packed bed may increase because powder is formed from wear and tear of the catalyst by friction among catalysts (page 4, lines 1-4 of the specification).

However, Codignola does not teach superficial velocity at all.

**Second**, in the Amendment filed September 27, 2007, Applicants calculated the superficial velocities of the Codignola's Examples based on the reaction conditions taught in Codignola's Examples and Applicants' definition of superficial velocity. The thus calculated superficial velocities are well outside the claimed range.

The Examiner contends that the Codignola process is not limited by examples since it has been held that a disclosure in a reference is not limited to its specific illustrative examples, but must be considered as a whole to ascertain what would be realistically suggested thereby to one ordinary skill in the art.

However, as noted above, Codignola does not teach superficial velocity at all. Therefore, Codignola as a whole does not teach or suggest what is presently claimed.

Further, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. See, MPEP 2144.05.IIB. Here, since Codignola does not teach superficial velocity at all, it would not have been obvious for one ordinary skilled in the art to select an appropriate superficial velocity of the hydrogen to operate the process at an optimized production of the desired product.

**Third**, the superficial velocity of gas is determined by the cross-sectional area of the reactor, reaction temperature, reaction pressure, and the amount of gas passed per unit time.

There is no guidance whatsoever in Codignola for one skilled in the art to select appropriate parameters to arrive at Applicants' claimed process. In other words, it would not have been obvious and it would not have been routine experimentation for one skilled in the art to have modified the process of Codignola to arrive at Applicants' claimed process.

Finally, the superior effects of the present invention, such as uniform flow of the liquid without localization in the packed bed, low pressure loss of the packed bed, and little formation of tar caused by olefin dimer formation and olefin polymer formation, can be attained by controlling the superficial velocity of gas to 3.0 to 10 cm/sec, and flowing the liquid and gas upwardly, and under the reaction conditions recited in Claim 1.

The superior effects provided by the present invention are evidenced by Examples 1 and 2 and Comparative Examples 1 and 2 of the specification.

In Examples 1 and 2 of the specification, the superficial velocity of the gas was 7 cm/sec and 6.5 cm/sec, respectively, and the reaction amount of  $\alpha$ -methyl styrene was 49 kmol/m<sup>3</sup> catalyst/hr and 71 kmol/m<sup>3</sup> catalyst/hr, respectively.

In Comparative Examples 1 and 2 of the specification, the superficial velocity of the gas was 2.7 cm/sec and 2.8 cm/sec, respectively, and the reaction amount of  $\alpha$ -methyl styrene was 14 kmol/m<sup>3</sup> catalyst/hr for Comparative Example 1 and 42 kmol/m<sup>3</sup> catalyst/hr for Comparative Example 2.

In the Amendment under 37 C.F.R. § 1.114(c) filed June 13, 2008, and in the Amendment under 37 C.F.R. § 1.116 filed September 8, 2009, Applicants explained that when the superficial velocity of the gas is lower than 3.0 cm/sec, the apparent reaction rate lowers, and when the superficial velocity is higher than 10 cm/sec, a pressure loss of the packed bed may increase; as a result, yield is lowered due to the tar formation, and the catalyst suffers from wear and tear, correspondingly.

In response, the Examiner took the position that these results are expected due to the residence time of the reaction and the flow rate of reactants.

With due respect, the Examiner's position is not reasonable. Applicants has determined a particular range of superficial velocity to thereby obtain superior results which would not have been expected from the cited art, which does not even discuss superficial velocity.

In view of the above, the present claims are not obvious and are patentable over Codignola. Reconsideration and withdrawal of the §103(a) rejection based on Codignola are respectfully requested.

Allowance is respectfully requested. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

*Hui Chen Wauters*  
Hui C. Wauters  
Registration No. 57,426

SUGHRUE MION, PLLC  
Telephone: (202) 293-7060  
Facsimile: (202) 293-7860

WASHINGTON OFFICE  
23373  
CUSTOMER NUMBER

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